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Submitted Papers

Survey of Interferometric Techniques used to test JWST optical components

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The James Webb Space Telescope program uses a variety of interferometric techniques to perform in-process, final certification and independent verification of primary mirror segments, the secondary mirror and tertiary mirror. These tests are done both under ambient and cryogenic conditions at Tinsley, Ball Aerospace and NASA Marshall Space Flight Center.

JWST mirror technology development

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Since the initial Design Studies leading to JWST, Mirror Technology was identified as a (if not the) critical capability necessary to enable the next generation of large aperture space telescopes required to achieve the science goals of imaging the earliest galaxies and proto-galaxies after the big bang. Specific telescope architectures were explored via three independent design concept studies conducted during the summer of 1996. Achieving the desired science objectives required a never before demonstrated space telescope capability, one with an 8 meter class primary mirror that is diffraction limited at 2 micrometers and operating in deep space at temperatures well below 70K. Beryllium was identified in the NASA "Yardstick" design as the preferred material because of its ability to provide stable optical performance in the anticipated thermal environment as well as its excellent specific stiffness. Because of launch vehicle constraints, two very significant architectural constraints were placed upon the telescope: segmentation and areal density. Each of these directly resulted in specific technology capability requirements. First, because the maximum launch vehicle payload fairing diameter is approximately 4.5 meters, the only way to launch an 8 meter class mirror is to segment it, fold it and deploy it on orbit - resulting in actuation and control requirements. Second, because of launch vehicle mass limits, the primary mirror allocation was only 1000 kg - resulting in a maximum areal density specification of 20 kg/m2.